

Subject: CHRYSLER N-Truck ATX Shifter	T.A. No.: 3960
Report Type: BENCH - DESIGN VERIFICATION	File No.: 74S7005D.PF1
Part Number(s): 974J-S7005	Date: January 15, 1996

Title: DURABILITY OF CHRYSLER N-TRUCK, ATX SHIFTER CONTROL ASSEMBLY

OBJECTIVE:

Determine if the shifter assembly conforms to the Teleflex specification Dwg 974J-S7005, Notes 3,4,8,9,10,11,12, and 14.

SAMPLE DESCRIPTION:

Twenty (20) Samples Durability Test: TFX. Part No 974J-S7005, Date Code 2755P, Test Numbers T95-1151 thru, T95-1170

SUMMARY:

Six (6), Controls, sample numbers T95-1151 - T95-1156, were removed from test, (material change, hole dia. change, and failure during the abuse test). Fourteen (14), Controls, sample numbers T95-1157 - T95-1170.

Transmission/Column End Fitting Loads; (section 3) All met the performance requirements.

Terminal & Core Loads; (section 4) All met the performance requirements.

Backlash; (section 8 & 12) Six (6) passed the backlash initially, ten (10) passed at end of test.

Operation Efforts; (section 9) All passed the operation effort.

Durability; (section 10) All passed the durability.

Construction Strength & Integrity; (section 11) All passed the this test.

Abusive Load; (section 14) All failed at the lock mechanism during the high temperature test.

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SPECIFICATION:***Transmission/Column End Fitting Loads; (section 3)***

Requirements; Must snap into a 2.80/3.30mm thick and 20.30/20.60mm diameter gage at a load less than 110N. Must withstand a 450N minimum pull out load.

Terminal & Core Loads; (section 4)

Requirements; Must withstand 890N tension with out failure, slipping, yielding and or cracking.

Backlash; (section 8 & 12)

Requirements; Must not exceed 1.20mm at start and 2.20mm after 50,000 cycles for a 17.8N tension and compression load, while at room temperature.

Operation Efforts; (section 9)

Requirements; Must not exceed 13.3N at 22.2°C for 0 thru 50,000 cycles.

Durability; (section 10)

Requirements; Must travel for 50,000 cycles without failure, physical deformation or cracks.

Construction Strength & Integrity; (section 11)

Requirements; Assembly must withstand a tensile load of 890N and a compressive load 180N. No yielding, permanent deformation or cracks are permissible.

Abusive Load; (section 14)

Requirements; Control must pass a 333.4N load out of the park position while at a temperature of -40°C, 23°C, and 177°C and traveling for 100 cycles.

PROCEDURE:***Data Collection Tests (sections 8,9,10 and 12)***

Remove the cycling drive arm motor out of the normal cycling path. Install the linear drive system with LVDT, and load cell onto the durability fixture.

Record the Backlash (section 8 and 12) at a load of 17.8N by fastening the lash pin to the fixture at the mid stroke position. Then snap the transmission terminal onto the lash pin. Set linear drive speed to a minimum setting without stalling the drive motor. Start linear drive and collect data with HP plotter using manual record mode. Lash is calculated as the travel at the column terminal when the control is cycled between 17.8N tension and 17.8N compression. Remove the transmission terminal from the lash pin on the fixture. Now remove the lash pin fixture from the durability fixture prior to cycling the sample.

PROCEDURE: (continue)**Data Collection Tests (sections 8,9,10 and 12)**

Record Operation Effort (section 9) with the pivot arm moved out of the way from the transmission terminal. The linear drive speed is set as noted above. Start linear drive and collect data with HP plotter using manual record mode. Operation effort is calculated as the load at the column with the transmission terminal under no load. Operation efforts were recorded at mid stroke loads in tension and compression.

Record the 89N Efficiency (section 10) by snapping the column end terminal onto the pin connected on the load cell. Set linear drive speed for ten (10) cycles per minute. Start linear drive and collect data with HP plotter using it's buffer mode. Efficiency is calculated as input load (load created by hydraulic cylinder) divided by output load (load at linear drive). The input load is 89N in both tension and compression. Disconnect transmission terminal at the hydraulic cylinder.

Repeat the above steps for all samples. Upon completion of the data collection, reset up the durability fixture for cycling. Remove the linear drive from the test fixture. Connect the transmission terminal onto the hydraulic load cylinder. Set the hydraulic cylinder loads to 89N. Start the test and run the following program for a total of 50,000 cycles.

Durability Test / Abusive (sections 10 and 14)

A two (2) station fixture was set up to cycle the controls. Each control was fixture in a vehicle configuration, with an appropriate chamber to control the environment. A load was developed through the use hydraulics and controlled to 89N in tension and compression directions. The drive motor was set at a speed of 10cpm with 53mm of travel for 50,000 cycles. After the base line performance measurements were collected the control was exposed to the following temperature program.

Step	Temp (°C)	Time	Comments
1	23.0	10Hrs 25Min	Hold and maintain the temp. while cycling the control.
2	-40.0	30Min	Ramp down to temp. over a half hour time period while cycling the control.
3	-40.0	1Hr 50Min	Hold and maintain temp and cycling.
4	177.0	8Hrs 20Min	Ramp up to temp. and hold while cycling the control

Repeat the above steps 1 thru 4 three (3) more times.

An abusive load of 333.4N out of the park position was applied while at -40°C, 23°C, and 177°C (trans end fitting only) for 100 cycles at each temperature.

DATA:

DATE 9/28/95
ATX - DVP & R, Chrysler, N - Truck
TFX. Part No. 974J-S7005

Sample No.	Initial Data			Final Data		
	Lash € 17.8N (mm)	Free State (N)	Eff. € 89N (%) T / C	Lash € 17.8N (mm)	Free State (N)	Eff. € 89N (%) T / C
	1	1.38 3.56	8.89 80.8	81.6		
2	1.23	10.23 6.23	83.9 95.7			
3*	1.05	5.34 8.90	60.0 65.8			
4*	1.78	6.23 8.45	75.0 69.0			
5**	1.87	6.01 7.56	66.7 73.1			
6**	1.60	7.56 5.78	66.7 73.1			
7***, #	1.20	6.67 8.89	69.8 69.2	2.13	4.89 8.45	71.8 73.2
8***, #	1.75	5.34 8.45	69.8 73.2	2.33	3.56 9.34	74.3 73.2

OBSERVATIONS:

Note: * New samples two types of conduit, trans end has FE-4200, the column end has FN-727.

** New samples latest level of end fitting (no guide, smaller dia then before), lock tab hard to load.

*** New samples, Set# 2 failed the abusive 200# out of park, at 176°C test, adjust system ratcheted on both controls. Set# 3 on-line changing temp of chamber B from 140/150°C to a max of 94°C.

- Both controls failed to met the abusive 200# load test.

The fixture drive arms are not set at the same level, this causes the force on the sample to be less than originally calculated for all samples. All numbers for efficiency have been corrected as of 11/2/95.

DATA 1 (continued)

DATE 9/28/95
ATX - DVP & R, Chrysler, N - Truck
TFX. Part No. 974J-S7005

Sample No.	Initial Data				Final Data			
	Lash @ 17.8N (mm)	Free State (N)	Eff. @ 89N (%)	T / C	Lash @ 17.8N (mm)	Free State (N)	Eff. @ 89N (%)	T / C
9	1.55	8.01	63.8		2.27	6.67	65.2	
		9.79	68.2			7.12	61.2	
10	1.50	6.23	70.5		1.50	14.23	68.2	
		7.56	73.2			15.57	68.2	
11	1.20	6.67	68.2		1.83	3.78	74.1	
		8.45	72.9			3.56	74.1	
12	1.63	8.45	68.2		1.63	3.56	70.9	
		4.89	71.4			5.34	74.7**	
13	1.23	6.01	73.2		2.28	9.79	75.0	
		8.45	74.1			5.78	76.9	
14	1.73	4.89	68.9		1.80	3.56	81.1	
		3.11	66.8			2.00	75.0	
15	1.75	6.67	73.2		1.88	5.78	71.4	
		8.45	76.9			6.45	72.3	
16	1.20	7.12	75.0		1.60	4.67	78.9	
		5.34	76.9			5.34	85.7	
17	0.88	5.34	74.1		N/A	N/A	N/A	
		7.56	75.9					
18	0.88	7.12	69.8		1.43	5.78	75.0	
		6.23	75.9			7.03	78.1	

Note: ** sample no. T95-1162 passed the abusive overload test at high temp.

N/A - Load

Not Available, T95-1167, failed due to a heavy input load to the control, causing the conduit to pull out of the adjust body.

The fixture drive arms are not set at the same level, this causes the force on the sample to be less than originally calculated for all samples. All numbers for efficiency have been corrected as of 11/2/95.

DATA: (continued)

DATE 11/13/95

ATX - DVP & R, Chrysler, N - Truck
TFX. Part No. 974J-S7005

Sample No.	Initial Data				Final Data			
	Lash @ 17.8N (mm)	Free State (N)	Eff. @ 89N (%)	T / C	Lash @ 17.8N (mm)	Free State (N)	Eff. @ 89N (%)	T / C
19	1.43	4.45	76.5		1.78	3.56	83.3	
		2.67	83.3			5.78	81.1	
20	1.10	4.89	69.5		1.73	3.11	76.5	
		7.12	78.9			5.34	73.2	

Note: Sample No. T95-1169 and T95-1170 passed the abusive overload test at room temperature and low temp, but failed the lock tab mechanism at high temp.

DATA: (continued)**ATX SHIFTER VALIDATION**
COLUMN END FITTING SNAP IN / PULL OUT - SECTION 3
PRODUCTION RELEASE TFX. Part No. 954P-S7203

Test Number	Snap In Load (N)	Full Out Load (N)
T94-0486	73.39	1823.68
T94-0487	87.18	1868.16
T94-0488	84.51	1890.40
T94-0489	80.06	1868.16
T94-0490	66.72	1845.92
T94-0491	75.62	1668.00
T94-0492	73.39	1823.68
T94-0493	62.27	1823.68
T94-0494	73.39	1868.16
T94-0495	73.75	1890.40
T94-0496	62.27	1868.16
T94-0497	71.17	1845.92
T94-0498	73.39	1845.92
T94-0499	62.27	1823.68
T94-0500	85.85	1734.72
T94-0501	71.17	1779.20
T94-0502	53.38	1845.92
T94-0503	75.62	1779.20
T94-0504	75.62	1823.68
T94-0505	62.27	1779.20
T94-0506	73.39	1779.20
T94-0507	73.39	1801.44

ATX SHIFTER VALIDATION
TERMINAL & CORE LOADS - SECTION 4 & 11
PRODUCTION RELEASE TFX. Part No. 954P-S7203

All samples met the requirements of not less than 890N tension.

EQUIPMENT:

XXY Recorder: Hewlett Packer Plotter, Model No. 7090A, Serial No. 2434A00491
Calibration Date 02/29/95

LVDT: Shavitz, Type 2000 HR, Serial No. 13325, Calibration Date 10/22/94

Load Cell: Interface, Model No. SM-100, Serial No. B05437

Bridge Amp: Gould, Model 11-4123-01, Serial No. 01205-01
Calibration done at time of Test.

Durability Fixture: Designed and Built by Teleflex Inc.